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RESEARCH REPORT

SPACE IN WARFARE

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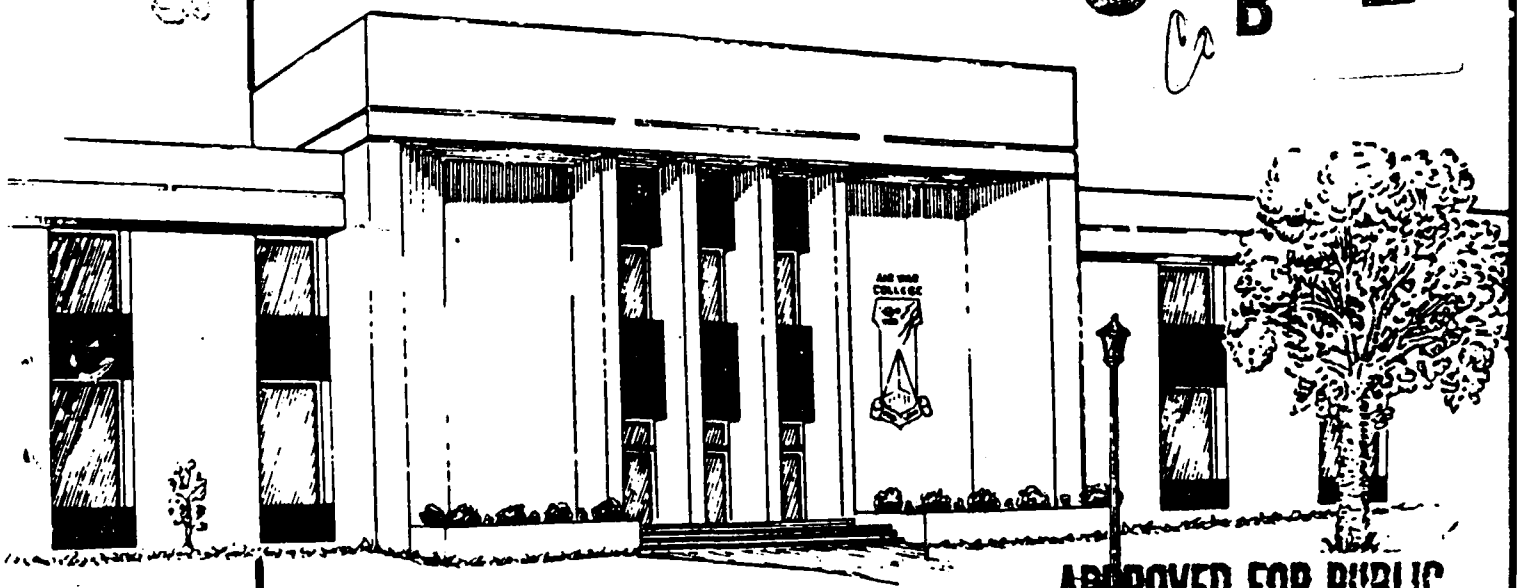

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SPACE IN WARFARE

by

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A DEFENSE ANALYTICAL STUDY SUBMITTED TO THE FACULTY

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EXECUTIVE SUMMARY

TITLE: Space in Warfare

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An application of the Principles of War with space as the primary focus illlustrates the contributions that space can make to the battlefield of today and tommorrow. Beginning with its birth in 1947, the United States Air Force has laid claim to the realms of space. Although officially given the space charter by Secretary of Defense Robert S. McNamarra in 1960, the United States Air Force as a whole has not been an articulate and knowledgeable advocate of space systems. This lack of advocacy is caused by a lack of understanding of the role of space in modern warfare. Once this understanding is gained, the warfighter will not only be able to use what space systems are available, but demand systems to better fulfill his needs.

BIOGRAPHICAL SKETCH

Lieutenant Colonel Julian W. Shattuck (B.S., Chemistry, United States Air Force Academy, M.M.A.S., United States Army Command and General Staff College) has been involved with space since 1977. He served in Southeast Asia, flying over 300 combat missions in the A-37. His first involvement with space systems was as a user of space products at the Defense Mapping Agency in 1977. He departed the Defense Mapping Agency in 1980 to be one of the 32 Air Force officers attending Army Command and General Staff College (CGSC). Upon completion of CGSC as a Distinguished Graduate, he was assigned to U.S.A.F. Space Division where he worked in the Defense Support Program Office and the Space Defense Program Office. From 1986-88, he was assigned to the National Aero-Space Plane Joint Program Office. He graduated from Defense Systems Management College in 1987. He is a graduate of the Air War College, Class of 1989.

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CHAPTER I

INTRODUCTION

Fiction about war in space has been with the United States (U.S.) for decades. Facts about war in space or space in warfare have yet to be fully developed. The United States Air Force (U.S.A.F.) should have developed these facts. It has had the Department of Defense's (DoD) stewardship of space for almost thirty years.

The Air Force has not ignored space. It has placed large sums of money and very talented people in the space arena. Several Chiefs of Staff have embraced space. The Air Force was the first service to create a space command. Yet, there has been a gulf between the space community and the rest of the Air Force. This gulf has kept the warriors out of space and space out of warfare.

To close this gulf will take an effort by officers at all levels. The officers outside the current space community have to be convinced that it is important for them to understand about space. Those with space expertise must share this knowledge with the rest of the Air Force.

This analytical study will demonstrate why it is important for all Air Force officers to understand space. The study will also present what the author believes has caused the gulf between the space community and the rest of the Air Force. The majority of the study will be devoted to

laying the groundwork for closing this gulf. This can best be done by presenting how the Principles of War apply to space.

CHAPTER II

BACKGROUND

> The United States Air Force is the primary aerospace arm of our nations Armed Forces . . . each of us as professional airmen, has a responsibility to be articulate and knowledgeable advocates of aerospace power.
>
> General Charles A. Gabriel[1]

The United States Air Force has laid claim to the realms of space since it became a separate service. In 1948, the Chief of Staff, General Hoyt S. Vandenburg, stated that the Air Force had the "logical responsibility" for satellites.[2] The Army and Navy disagreeded and thus all three services began efforts aimed at launching a satellite. When the need for a Inter-Contential Ballistic Missle (ICBM) was recognized, the Air Force put satellite and booster development on low priority in order to avoid resource conflicts. Even though limited resources kept the Air Force from developing satellites and boosters, the Air Force's thoughts in this area were developing. In February 1957, General Bernard Schriever, the father of the ICBM, postulated that "our safety as a nation may depend upon our achieving space superiority."[3]

This thought grew into the need for the control of space. Chief of Staff General Thomas D. White believed that "We airmen . . . must win the capability to control space."[4] The launch of Sputnik I in October 1957, placed the Union of Soviet Socialist Republics (U.S.S.R). and the United States

into a race for space. This national focus on space and its possibilities brought the realization of the need for space control to the forefront at the highest levels of our government. President Kennedy's deep concern for space control was articulated in 1960 when he stated, "If the Soviets control space, they can control Earth, as in past centuries the nation that controlled the seas dominated the continents."[5]

The battle for which service was to lead the space effort was finally settled in 1961 with the Air Force being officially given stewardship of space by Robert S. McNamarra, the Secretary of Defense.[6] Yet, 41 years after General Vandenburg's assertion and 31 years after Sputnik formally launched the space race, the majority of USAF officers cannot be articulate advocates of the space portion of aerospace power due to their lack of knowledge.

The need to be knowledgeable and articulate is twofold. The first is tied to the choices one must make with limited resources. U.S. military power is dependent upon how it spends its annual appropriations. The USAF cannot "fly and fight" at its peak if the right systems have not been developed and procured. The priorities established now will decide how the Air Force fights in the 21st century. Former NATO Ambassador David Abshire expressed some telling thoughts on tightened budgets. He believes tightened budgets "translate into hard choices for the American people, hard choices for the new president and hard choices for

Congress."[7] Rep. Les Aspen put it this way "The only way to make some sense of the defense budget at the constrained funding levels . . . is to plan our forces with an idea of what are our priorities."[8] The ability to establish priorities that include space systems will only come when we are as knowledgeable about space power's role as we are about airpower's role.

The more important reason is that Air Force officers need to ensure that space, consistent with fiscal restraints, plays its proper role. Space power, like all aspects of military power, must contribute to achieving the national objectives. Space systems must help deter war and if deterrence fails, then space must contribute to the war effort. General Piotrowski, Commander in Chief of U.S. Space Command and North American Aerospace Defense Command, believes that agressiveness in making U.S. space needs known is key to ensuring space contributes its all to the American military.[9] However, to be more agressive Air Force officers must be knowledgeable of how space can contribute. The fighter pilot, the airlift crew member, the missileer must know how space can enhance his mission and demand that space systems are there when and where needed.

The space community has not helped the rest of the Air Force to become knowledgeable about the true nature of the use of space in support of a land, sea, or air commander. There is a tendency to be glib with cute sayings like "Space

is the Place," "Space is the Fourth Medium," "Space is the Ultimate High Ground," or to talk like rocket scientists with explanations of apogee, parogee or the energy required to change orbits. They should be articulating how they can help others to "fly and fight" or how they could fight the war in space.

This author believes that there are two impediments to a space-knowledgeable and articulate Air Force. The first roadblock is that the Air Force has not considered the use of space in a war fighting language. This study will use the principles of war as stated in AFM 1-1 to give a generic underpinning to the war fighting considerations. The second hinderance to understanding space war fighting capabilities is the classification level of most space systems. This study was kept unclassified to assure wide dissemination and reading. This limits the examples of the real contributions space has already made to the warfighters.

CHAPTER III

THE PRINCIPLES OF WAR

This study will use the "Principles Of War" as stated in AFM 1-1 to enlighten the reader on how space can and should contribute to our war fighting capability. AFM 1-1 lists 13 principles of war. This study will address 11 of the 13. The principles of the objective and cohesion will not be addressed. The principle of the objective addresses what one wants to do, not how one will do it. The principle of cohesion refers to developing a state of mind and mental readiness and, although critical in war, it is not systems dependent.

Offense

> The . . . offense is to act rather than react . . . enables commanders to select priorities of attack, as well as time, place, and weaponry.[1]

Today, the principle of the offense is addressed by space in a support role only. This role is in the command, control and communication (C^3) and intelligence (C^3I) areas. Satellites have the capabilities to allow us to know where the enemy is and what he is doing. Satellites can provide the up-to-date weather of proposed targets. The satellite C^3 infrastructure allows us an ability to quickly react to the information provided by our other satellite systems.

Space should not be relegated to a support role in the offense. Air superiority is not established without the capability to conduct offensive air operations. As one goes through this study and understands what space can do, remember the U.S.S.R. intends to make full use of their space systems during a conflict. Their development of an ASAT demonstrates an intention on their part to put U.S. satellites at risk. The U.S has no operational weapons system that can clear the "skys" of their satellites or that can protect the U.S.'s satellites from U.S.S.R.'s ASAT. If the U.S. is going to control space as it intends to control the "skys," it must have an anti-satellite (ASAT) capability.

AFM 1-1 stresses the ability of aerospace forces to strike deep without having to defeat defending forces in depth. This is especially true for ordinance coming from space. There is no need to limit thinking of space delivered destruction to a war between super powers. Weapons of this sort could be applicable across the entire range of conflict and would have the advantage of avoiding forward basing or deployment.

Surprise

> Surprise is attack of the enemy at a time, place, and manner the enemy is neither prepared for nor expecting. The principle . . . is achieved when an enemy is unable to react effectively . . .[2]

As in the offensive, space contributes to surprise by providing near real time information about the enemy. This information could allow the U.S. to attack before the enemy

knows that he is vulnerable. Surprise can further be enhanced, because this information can normally be obtained without alerting the enemy. Most nations have the ability to detect an overflight even of the SR-71 variety, but very few can detect a space object. They must rely on ground tracks provided by one of the few nations that can detect space objects. Even if the enemy knows the ground track of a space object, they still won't know when the sensors are operating or if an increase in collection rate has taken place.

A limited capability to track space objects also means any weapons delivered from these systems ensure surprise. If the enemy cannot detect an object in space, the first indication of an attack associated with a space delivery system would be ordinance impact.

Security

> Security is taking continuous positive measures to prevent surprise and preserve freedom of action. Security involves active and passive measures . . . [3]

Again satellite supported C^3I comes to the forefront. The information gathered on the enemy for use in the offensive can also be used to predict the action of the enemy and allow one to take the proper security measures. The Indication and Warnings (I&W) ability of satellites may be their greatest contribution to our capability to deter a major war. The C^3 network contributes by providing timely notification of the I&W information.

The security of space systems is much the same as securing air systems. The command and control nodes (earth based) must be hardened against attack. Where at all possible, dependence on overseas ground stations must be removed. This calls for cross-linking commands through other satellites to a CONUS ground site. Mobile ground stations that disperse on strategic warning is another method of providing security for satellite control systems during crisis or war.

The principle of security can be applied in an active fashion to the space control role. After an outbreak of hostilities, the U.S. should take an offensive approach to preventing the enemy's space assets from collecting information. To accomplish this the U.S. would destroy the enemy's satellite by the use of an ASAT or destroy his means to launch satellites.

Mass and Economy of Force

> Concentrated firepower can overwhelm enemy defenses and secure an objective at the right time and place.[4]

Mass and economy of force are relative terms. They are dependent on the size and makeup of the enemy forces that are being attacked or held. Again, the use of satellites to gather intelligence on the enemy becomes paramount to the planning of where and when to mass and where an economy of force will work.

One must also consider the massing of space assets to truly apply the principle. This would equate to placing

enough systems into the area to collect the required information and to provide the C^3 network to get the information to the right user. If offensive space weapons are developed, the ordinance delivered would contribute either to concentrating firepower on the main objective or providing the firepower needed with the economy of force effort. In the ASAT role, for example, this could include the massing of ASATs in order to sweep the "skies" of enemy spacecraft that affect the theater.

Maneuver

> Maneuver is the movement of friendly forces in relation to emeny forces . . . permits rapid massing of combat power and effective disengagement of forces.[5]

The principle of maneuver is currently associated with space systems when, to ensure the massing of space systems, they change orbits or point sensors and antennas. Unfortunately, the limited ability to point sensors and antennas restricts just how much space presence one can mass. Major orbital changes are limited by the propellants on board and the time required for the change. We could, of course, launch a new satellite. However, current U.S. launch responsiveness is constrained by a limited number of boosters and the length of time required from launch. Currently, countdowns take over 120 days after the decision to launch is made. After a successful launch, an extensive orbital check-out normally is required. So, even though space systems

travel at Mach 25+, today the time required to mass space systems equates to systems that are not very maneuverable.

One class of satellites being considered for the future will provide more maneuverability in space. "Cheap sats" are envisioned to be limited in capabilities and lifetime. The relative simplicity allowed by the decrease in capabilities and lifetime would limit the amount of on-orbit check-out time required to become fully operational.

This simplicity would also significantly lower the costs. The cost goal is a price that would allow cost effective use during a crisis. The "cheap sat" development would have to be accompanied by the development of a very robust launch capability. The boosters would have to be affordable and capable of launching on demand, not schedule. The 120-day schedule associated with todays launches does not equate to launch or demand. In 120 days, most crisises would be over.

Another solution would be the development of a system based on the technology used in the National Aero-Space Plane (NASP), the Advanced Launch System (ALS), or a more operationally capable shuttle type vehicle. The current shuttle requires too much down time between flights to be considered operational. These other vehicles would be capable of rapid launch with payload pallets engineered for the particular mission requirements. The rapid launch response and lack of the need for the on-orbit check-out would provide the ultimate in space maneuverability.

A vehicle with a quick launch capability that goes at orbital velocities can be anywhere on earth within almost 90 minutes. This could mean that one could have a sensor package or weapons on a target in a time frame that by today's standards would seem instanteous.

Timing and Tempo

> Timing and tempo is . . . executing military operations at a point in time and at a rate which optimizes the use of friendly forces. . . . The purpose is to dominate the action.[6]

AFM 1-1 stresses the importance of C^3I in ensuring that U.S. forces set the timing and tempo of the war. Again, space assets will play a major role in the C^3I required for setting the time and tempo. For all the reasons stated previously, the time scale that can be achieved by space systems will allow us to get inside the enemy's decision cycle. Once we have done this, the timing and tempo are ours.

Unity of Command

> Unity of command is . . . vesting appropriate authority and responsibility in a single commander to effect unity of effort.[7]

Control of all space systems resides with CINC Space. In time of national emergency or war, systems other than those of the Department of Defense (DoD) may well come under his control. The reasoning behind this is, during global war, orbiting satellites will cover more than one CINC's territory and someone will need the big picture. This follows the unity of command principle and is the right thing to do.

In a theater war or limited conflict, control of space assets still resides with CINC Space. This violates the unity of command principle and is wrong. The supported

CINC should either be able to determine orbits and targets, or he should be given his own satellites to control. Since the supported CINC won't have the ground control stations or expertise to actually operate these satellites, Space Command personnel would sit at the consoles. The Space Command personnel would, therefore, have to be operationally subordinated to the supported CINC. These satellites dedicated to the supported CINC do not necessarily have to be the main system. They could be on-orbit spares, replacements that are launched early for aging birds, new launches that will be turned into on-orbit spares after the crisis, or the cheap sats discussed previously. This allows the supported CINC satellite support without degrading overall posture.

Logistics

> Logistics is . . . sustaining both man and machine in combat by obtaining, moving, and maintaining warfighting potential. Success in warfare depends on getting sufficient men and machines in the right position at the right time.[8]

Logistics applied to current space operations translates to on-orbit spares or satellites already built and ground tested. With the exception of a few Space Shuttle experiments, satellites are not repaired or refueled in orbit. One of General Piotrowski's concerns is our current lack of logistics ability. He believes our performance in space is a "thin blue line." We lack the needed on-orbit spares or launch capability to replace satellites that fail or are destroyed during a crisis.[9]

The concept behind on-orbit spares is two-fold. First, if launch and on-orbit checkout are done prior to the loss, replacement does not require the time involved with launch and initial on-orbit checkout, thus providing quicker response time. While one might think whatever "killed" the operational satellite would kill the spare, this is not necessarily so. With the major electronics and sensors off, the modes of damage are severly restrained. The U.S.S.R's ASAT can only destroy one target per launch. Second, an on-orbit spare can help contribute during system overload. For example, if one had on-orbit spares for communication satellites, one could immediately activate the space new satellite if a satellite was lost, or if the channels became overloaded.

There are two advantages of a rapid launch capability over on-orbit spares. One is avoiding the harsh environment in space as long as possible. The space environment limits the time a satellite can be useful in orbit even with most systems off. The other advantage is the capability to place a satellite in the exact orbit needed. An on-orbit spare may require time to be moved to a proper orbit to act as effective replacement. The current aim for the ALS and NASP would be a rapid enough response to make launching into the proper orbit quicker than moving spares. The only advantage with spares then would be the much shorter on-orbit check out time and avoiding the launch crunch that may well come if we start losing satellites in war.

Simplicity

> Simplicity promotes understanding, reduces confusion and permits ease of execution in the intense and uncertain environment of combat . . . preparation in peacetime enhances the simplicity . . .[10]

Despite the complex technologies involved with space systems, the principle of simplicity can still be applied to the use of space systems. We need to keep complexity out of the way we control and disseminate information obtained from our space sensors. If we use "cheap sats," mass and manuever comsats, take the offensive with ASATs or whatever, we need plans. Plans that "promote understanding, reduce confusion, and permit ease of execution."[11] Also adding to simplicity in war is realistic practice. If we intend to use space assets in war we must practice with them in peace. The U.S.S.R. does! A Vice CINC of a unified command recently explained one of his command's plans to the Air War College. His mission was totally dependant on satellite communications. During the question and answer period, he stated that he did not know if the number of communications channels required would be available. He had not practiced his plan with the communications required.

CHAPTER IV

CLASSIFICATION OF SPACE MISSIONS

President Eisenhower made the original decision to classify U.S. space missions. To remain unclassified, this study cannot mention what drove that decision. Classification has caused problems from the beginning. While relating problems of the early days in space, a very senior officer told this author that systems of unknown origin were sometimes discovered in close proximity to a system that had just been launched. It turned out that these systems did not always belong to the U.S.S.R., but often were other U.S. classified satellites.

Although the U.S. has solved the conflict of orbit problems caused by classification, the U.S. warfighter is plagued in other ways by classification. A recent speaker at the Air War College related a problem he encountered. He was being provided intelligence information for a mission personally approved by the President. The speaker realized his staff had been provided out of date information due to classification problems. He knew the information was not current, not because he was a general officer in charge of this critical mission, but because by luck he had once held a job with the right clearances.

There is another frustration associated with the classification surrounding space systems. There are many

books and articles written that "speculate" on what the U.S. does in space. The U.S. Government has acknowledged that spys have given the U.S.S.R. information concerning some of our major systems. Yet, the U.S. does not let its warfighters know what to ask for.

Lt. Gen. Donald Kutyna, Commander Air Force Space Command, has stated, "We are space vehicle operators and representatives of the ultimate users of space--our fighting soldiers, sailors and airmen . . . "[1] How can soldiers, sailors, and airmen use space systems if they do not know what is there to be used? How can soldiers, sailors, and airmen ensure space is responsive to our needs if they do not know what is there? These same uninformed soldiers, sailors, and airmen contribute to the setting of our defense priorities without fully understanding what space can do for the warfighter. The actual data and accuracies involved can remain classified, but at least the type of information should be acknowledged.

CHAPTER V

CONCLUSIONS

Today's Air Force officer should be knowledgeable and articulate about space power. To date, there have been two reasons the majority of our officers have not been knowledgeable. The space community and the warfighters have not shared a common frame of reference and classification has stymied the flow of information.

This study, by applying the principles of war, has determined that space is an integral part of U.S. war fighting capability. Not so much "Space is a place," but "Space has a place!" Based on the fundamentals the United States Air Force ascribes to, it is evident that space has a place. With this understanding of how the principles of war tie space into U.S. military might, the warfighter should determine additional ways space can contribute to the conduct of his part of the battle.

The warfighter should also understand how space power like air power has certain requirements not directly linked to the air battle. Space supremacy and control are as important as air supremacy and control. There are space logistics issues and space survivability issues to be addressed. These issues and requirements must be in the list of defense needs that the senior Air Force leadership must prioritize.

It should be clear that security must be continually addressed. Efforts must be made on both sides to ensure that over-classification does not prevent mission success. The warfighter must know what space can do to properly fight on the battlefields of today and tomorrow.

NOTES
CHAPTER II (Pages 3-6)

1. AFM 1-1, Basic Aerospace Doctrine of the United States Air Force. (16 March 1984), p. 1:1.

2. Bruno W. Augenstem. "Evaluation of the U.S. Military Space Program, 1945-1960: Some Key Events in the Study, Planning, and Program Development," International Security Dimensions of Space. (Hamden, Connecticutt: Archon Books, 1984), p. 273.

3. Robert Frank Futrell. Ideas, Concepts, Doctrine: A History of Basic Thinking in the United States Air Force 1907-1964 (Maxwell Air Force Base, Alabama: Air University, 1974), p. 279-280.

4. Futrell, Ideas, Concepts, Doctrine, p. 280.

5. Colin S. Gray. American Military Space Policy (Cambridge, Massachussetts: Abt Books, 1983), p. 1.

6. Major Richard McNally. "Boosting America's Space Program," Airman. Vol. XXXII, No. 9 (September, 1988), p. 15-9.

7. Charlie Schill. "Hard Choices Likely for Pentagon in 1990's," Air Force Times, (November 14, 1988), p. 3.

8. Schill, "Hard Choices" p. 3.

9. David Fulghum. "Space Commander Aims at Sky vs. Space Barrier," Air Force Times, (November 14, 1988), p. 34.

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CHAPTER III (Pages 7-17)

1. AFM 1-1, Basic Aerospace Doctrine, p. 2-6.
2. AFM 1-1, Basic Aerospace Doctrine, p. 2-6.
3. AFM 1-1, Basic Aerospace Doctrine, p. 2-6.
4. AFM 1-1, Basic Aerospace Doctrine, p. 2-6.
5. AFM 1-1, Basic Aerospace Doctrine, p. 2-6.
6. AFM 1-1, Basic Aerospace Doctrine, p. 2-6.
7. AFM 1-1, Basic Aerospace Doctrine, p. 2-6.
8. AFM 1-1, Basic Aerospace Doctrine, p. 2-6.
9. Fulghum, "Space Commander," p. 34.
10. AFM 1-1, Basic Aerospace Doctrine, p. 2-8.
11. AFM 1-1, Basic Aerospace Doctrine, p. 2-8.

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1. McNally, "Boosting America's Space Program," p. 45.

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